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## PART I - ADMINISTRATIVE

### Section 1. General administrative information

#### Title of project

Habitat Restoration/Enhancement Fort Hall Reservation

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**BPA project number:** 9201000

**Contract renewal date (mm/yyyy):** 10/1999 ☐ **Multiple actions?**

**Business name of agency, institution or organization requesting funding**

Shoshone-Bannock Tribes

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**Business acronym (if appropriate)** SBT

#### Proposal contact person or principal investigator:

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**NPPC Program Measure Number(s) which this project addresses**

10.3E.10, 10.3E.11, 10.3E9

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**FWS/NMFS Biological Opinion Number(s) which this project addresses**

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#### Other planning document references

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#### Short description

Provide conditions to maintain a self-perpetuating tribal subsistence and trophy trout fishery through implementation of habitat restoration, enhancement, and protection activities on the Fort Hall Reservation.

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#### Target species

Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*)

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### Section 2. Sorting and evaluation

**Evaluation Process Sort**

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
<input type="checkbox"/> Anadromous fish <input checked="" type="checkbox"/> Resident fish <input type="checkbox"/> Wildlife	<input checked="" type="checkbox"/> Multi-year (milestone-based evaluation) <input type="checkbox"/> Watershed project evaluation	<input type="checkbox"/> Watershed councils/model watersheds <input type="checkbox"/> Information dissemination <input checked="" type="checkbox"/> Operation & maintenance <input type="checkbox"/> New construction <input type="checkbox"/> Research & monitoring <input checked="" type="checkbox"/> Implementation & management <input type="checkbox"/> Wildlife habitat acquisitions

**Section 3. Relationships to other Bonneville projects**

***Umbrella / sub-proposal relationships.*** List umbrella project first.

Project #	Project title/description

***Other dependent or critically-related projects***

Project #	Project title/description	Nature of relationship
9500600	Shoshone-Bannock/Shoshone Paiute Joint Culture Facility	Provides seed stock to re-establish Yellowstone cutthroat on the Fort Hall Reservation

**Section 4. Objectives, tasks and schedules**

***Past accomplishments***

Year	Accomplishment	Met biological objectives?
1993	3,850 m jack and rail exclosure fence	yes
1993	7,124 willow shoots planted	yes
1993	760 m evergreen revetments	yes

1993	Numerous bank slopings and structures	yes
1993	Monitoring and evaluation of biotic and abiotic variables	yes
1994	6,000 m jack and rail exclosure fence	yes
1994	9,618 willow shoots, 130 cattails planted	yes
1994	300 m evergreen revetments	yes
1995	1,200 m jack and rail exclosure fence	yes
1995	2,105 willow pole cuttings, 193 cattails, 95 wattles planted	yes
1995	371 m evergreen revetments	yes
1995	Numerous bank slopings and structures	yes
1995	Monitoring and evaluation of biotic and abiotic variables	yes
1996	1,845 willow pole cuttings, 30 cattails planted	yes
1996	660 m evergreen revetments	yes
1996	Repair of numerous bank slopings and structures	yes
1996	Monitoring and evaluation of biotic and abiotic variables	yes
1997	1,745 willow pole cuttings planted	yes
1997	297 m evergreen revetments	yes
1997	Repair and construction of bank slopings and structures	yes
1997	Monitoring and evaluation of biotic and abiotic variables	yes
1998	1,500 m jack and rail exclosure fence	yes
1998	935 willow pole cuttings planted	yes
1998	1,230 m evergreen revetments	yes
1998	Repair of bank slopings and structures	yes
1998	Monitoring and evaluation of biotic and abiotic variables	yes

### ***Objectives and tasks***

<b>Obj 1,2,3</b>	<b>Objective</b>	<b>Task a,b,c</b>	<b>Task</b>
1	Collect baseline data at project locations.	a	Measure abiotic stream habitat variables in stream reaches, including: channel morphology, substrate composition, water chemistry.
		b	Measure biotic stream habitat variables in stream reaches,

			including: fish and invertebrate community composition, densities, and biomass.
2	Install habitat improvement structures to increase existing juvenile and adult salmonid habitat (i.e. spawning, rearing, and object cover).	a	Evaluate habitat enhancement projects completed in previous years and modify to increase efficacy.
		b	Construct and install new habitat structures in project areas.
		c	In close proximity to treatments, monitor fish populations annually or biennially, revegetation mortality seasonally, and stream cross-section profiles annually or biennially.
		d	Maintain bank and channel treatments on an as needed basis.
3	Protect and restore riparian habitats of Reservation streams.	a	Plant pole cuttings of native willow and cottonwood. Plant native grass and wetland plants.
		b	Erect fences to protect riparian areas and critical spawning habitats. Implement grazing schemes to protect riparian areas.
		c	Maintain fences on an as needed basis.
4	Deter and reduce non-game fish migrations into Fort Hall Reservation	a	Maintain permanent weir on Spring Creek.
		b	Remove common carp ( <i>Cyprinus carpio</i> ) from Clear, Big Jimmy, and Spring Creeks when sampling for trout.
5	Promote Tribal fisheries management objectives in the Snake River basin.	a	Participate in forums and meetings that affect regional use, storage, and regulation of Snake River flows to promote fisheries restoration.
		b	Solicit design and cost-share projects pertaining to Snake and Blackfoot Rivers and American Falls Reservoir habitat enhancement and management.
6	Prepare report on project progress and results.	a	Analyze data and draft annual report containing information listed in the terms and conditions of contract 92-10.

		b	Submit quarterly reports addressing progress by task on objectives 1-5.
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### ***Objective schedules and costs***

<b>Obj #</b>	<b>Start date mm/yyyy</b>	<b>End date mm/yyyy</b>	<b>Measureable biological objective(s)</b>	<b>Milestone</b>	<b>FY2000 Cost %</b>
1	3/1992	10/2007	Baseline data collected for all impacted streams on Fort Hall Reservation	X	20.00%
2	3/1992	10/2007	Habitat enhancement implemented on all affected Reservation Streams	X	20.00%
3	3/1992	10/2007	Habitat restoration/protection implemented on all affected Reservation Streams	X	30.00%
4	3/1992	10/2007	Reduction of direct and indirect competition with non-native fishes		10.00%
5	3/1992	10/2007			10.00%
6	3/1992	10/2007			10.00%
				<b>Total</b>	100.00%

### **Schedule constraints**

**Completion date**  
10/2007

## **Section 5. Budget**

**FY99 project budget (BPA obligated):** \$162,748

### ***FY2000 budget by line item***

<b>Item</b>	<b>Note</b>	<b>% of total</b>	<b>FY2000</b>
Personnel	Resident Fisheries Coordinator, Biologist (part), Technician, Field Assistant, Secretary (part)	%41	54,000
Fringe benefits	34%	% 14	18,360
Supplies, materials, non-	Field Supplies, Office Supplies,	% 2	3,200

expendable property	Gas & Oil		
Operations & maintenance	Equipment Maintenance (i.e. electrofishers, generators, vehicles)	% 2	3,000
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	Jack and Rail fencing	% 15	20,000
NEPA costs		% 0	0
Construction-related support		% 0	0
PIT tags	# of tags:	% 0	0
Travel	Professional Society Meetings, Workshops	% 3	4,000
Indirect costs	28% of Salary and Fringe	% 15	20,261
Subcontractor	Field assistance from Salmon Corps	% 4	5,000
Other	Pickup Lease	% 4	5,000
<b>TOTAL BPA FY2000 BUDGET REQUEST</b>			<b>\$132,821</b>

### ***Cost sharing***

<b>Organization</b>	<b>Item or service provided</b>	<b>% total project cost (incl. BPA)</b>	<b>Amount (\$)</b>
		% 0	
		% 0	
		% 0	
		% 0	
<b>Total project cost (including BPA portion)</b>			<b>\$132,821</b>

### ***Outyear costs***

	<b>FY2001</b>	<b>FY02</b>	<b>FY03</b>	<b>FY04</b>
<b>Total budget</b>	\$135,000	\$135,000	\$140,000	\$140,000

## **Section 6. References**

<b>Watershed?</b>	<b>Reference</b>
<input type="checkbox"/>	Arthaud, D. L. and D. Taki. 1994. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1993 Annual Report to Bonneville Power Administration, Project 92-10, Portland, Oregon.
<input type="checkbox"/>	Arthaud, D.L., Colter, C.G., and J. Gregory. 1995. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1995 Annual Report to Bonneville Power Administration, Project 92-10, Portland, Oregon.
<input type="checkbox"/>	Arthaud, D.L., C.G. Colter, and D.C. Moser. 1996. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1996 Annual Report to

	Bonneville Power Administration, Project 92-10, Portland, OR.
<input type="checkbox"/>	Binns, N. A. 1994. Long-term responses of trout and macrohabitats to habitat management in a Wyoming headwater stream. <i>North American Journal of Fisheries Management</i> 14: 87-98.
<input type="checkbox"/>	Clary, W.P. and B.F. Webster. 1989. Managing Grazing Areas of Riparian Areas in the Intermountain Region. USDA Forest Service, Intermountain Research Station, GTR INT-263.
<input type="checkbox"/>	Crispin, V., R. House and D. Roberts. 1993. Changes in instream habitat, large woody debris, and salmon habitat after the restructuring of a coastal Oregon stream. <i>North American Journal of Fisheries Management</i> . 13: 96-102.
<input type="checkbox"/>	Duff, D.A. 1977. Livestock grazing impacts on aquatic habitat in Big Creek, Utah. Paper presented at the symposium on livestock interactions with wildlife, fish, and their environments, May 1977, Sparks, Nevada. University of California, Davis.
<input type="checkbox"/>	Hamilton, K. and E.P. Bergerson. 1989. Methods to estimate aquatic habitat variables. USF&WS, BOR Engineering and Research. Denver, CO 80225
<input type="checkbox"/>	Hoag, J. C. And D. Ogle. 1995. Riparian zone ecology, restoration, and management workshop. USDA - Natural Resources Conservation Service, April, 1995. pp. 150.
<input type="checkbox"/>	House, R.A. and P.L. Boehne. 1986. Effects of instream structures on salmonid habitat and populations in Tobe Creek, Oregon. <i>North American Journal of Fisheries Management</i> 7: 351-356.
<input type="checkbox"/>	House, R. 1996. An evaluation of stream restoration structures in a coastal Oregon Stream, 1981-1993. <i>North American Journal of Fisheries Management</i> 16:272-281
<input type="checkbox"/>	Kauffman, J.B., R.L. Beschta, N. otting, and D. Lytjen. 1997. An ecological perspective of riparian and stream restoration in the wester United States, <i>Fisheries</i> , Vol. 22, No. 5: 12-24.
<input type="checkbox"/>	Madsen, B.L. 1995. Danish watercourses-ten years with the New Watercourse Act. Danish Environmental Protection Agency, Ministry of Environment and Energy, Denmark.
<input type="checkbox"/>	Madsen, B.L. 1995. Danish watercourses-ten years with the New Watercourse Act. Danish Environmental Protection Agency, Ministry of Environment and Energy, Denmark.
<input type="checkbox"/>	Malvestuto, S. P. 1983. Sampling the recreational fishery. In L. A. Nielsen and D. L. Johnson editors. <i>Fisheries Techniques</i> pp. 397-430.
<input type="checkbox"/>	Moser, D.C. And C.G. Colter. 1997. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1997 Annual Report to Bonneville Power Administration, Project 92-10, Portland, OR.
<input type="checkbox"/>	Moore, K.M.S., and S.V. Gregory. 1988. Response of young of the year cutthroat trout to manipulation of habitat structure in a small stream. <i>Trans. Am. Fish Soc.</i> 117:162-170.
<input type="checkbox"/>	Moser, D.C 1998. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1998 Annual Report to Bonneville Power Administration, Project 92-10, Portland, OR.

<input type="checkbox"/>	Myers, T.J. and S. Swanson. 1995. Impact of deferred rotation grazing on stream characteristics in central Nevada: A case study. North American Journal of Fisheries Management 15: 428-439.
<input type="checkbox"/>	Platts, W.S. 1981. Impairment, protection, and rehabilitation of Pacific salmonid habitats on sheep and cattle ranges. Pages 82-92 in Proceedings: propagation, enhancement, and rehabilitation of anadromous salmonid habitat in the Pacific northwest. Hu
<input type="checkbox"/>	Platts, W.S. and J.N. Rinne. 1985. Riparian stream enhancement management and research in the Rocky Mountains. North American Journal of Fisheries Management 5: 115-125.
<input type="checkbox"/>	Rinne, J.N. 1981. Stream habitat improvements and native trouts. USDA, Forest Service research note RM-409.
<input type="checkbox"/>	Taki, D. and D. Arthaud. 1993. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1992 Annual Report to the Bonneville Power Administration, Project 92-10, Portland Oregon.
<input type="checkbox"/>	United States Dept. of Agriculture. 1989. Fisheries habitat surveys handbook. USDA Forest Service, Intermountain Region.
<input type="checkbox"/>	Zippen, C. 1956. An evaluation of the removal method of estimating animal populations. Biometrics 12(2): 163-169.

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## PART II - NARRATIVE

### Section 7. Abstract

Streams on the Fort Hall Reservation have suffered from years of unrestricted grazing and rapid flooding and drafting of American Falls Reservoir. Negative impacts from loss of bank vegetation and resultant lateral scouring and downcutting of streambanks include; siltation of spawning gravels, loss of object cover and pool depth, increasing width depth ratios of stream channels, and resulting increases in water temperature. The primary goal of the project is to facilitate recovery of native fish and wildlife populations to near historic levels on the Fort Hall Reservation. Enhancement and restoration techniques thus far have included use of instream structures to provide cover for fishes and direct flow from unstable streambanks (i.e. rock and wood wing dams and barbs), sloping of streambanks, revegetation with native riparian species, and fencing of project areas and sensitive riparian areas. Since 1992, overall fish population densities have increased five fold from pre-project levels in Clear Creek. Stream depth has increased significantly in project areas, and new areas of clean spawning gravels have been created. Many areas of actively eroding streambank have been stabilized, revegetated, and protected with enclosure fencing. Monitoring and evaluation since project inception in 1992 has included collection of baseline and annual data on relevant biotic and abiotic variables, including; fish community composition, biomass and densities, invertebrate community composition and densities, channel morphology, riparian health, and water quality parameters. This project directly addresses priorities as stated in Section 10 of the 1994 Fish and Wildlife Program by benefiting weak but recoverable native fish

populations and important trophy trout and subsistence fisheries within the Fort Hall Reservation.

## **Section 8. Project description**

### **a. Technical and/or scientific background**

The Fort Hall Indian Reservation, located in southeastern Idaho, is drained by more than twenty streams. Of particular importance are streams in the Fort Hall Bottoms, a large wetland adjacent to the Snake River near its entrance into American Falls Reservoir. These streams are all spring fed, low gradient, and relatively short in length.

Of the four primary Bottoms spring streams, Spring Creek is the largest (discharge averages 12.75 m<sup>3</sup>/s and is approximately 15 km in length) and Clear Creek is the second largest (discharge averages 4.5m<sup>3</sup>/s and is approximately 11 km in length). These Bottoms streams provide critical wintering, spawning and nursery habitats for adfluvial and resident salmonids (Taki and Arthaud 1993). The streams, lateral springs, and surrounding marshlands are also heavily used by wintering and nesting waterfowl, shorebirds, and raptors. Bald eagles and trumpeter swans winter, nest, and feed on the Bottoms.

Streams on the Fort Hall Bottoms have been affected by a variety of sources including, American falls Dam construction and operations, upstream Snake River operations, Snake River channelization off reservation, and livestock grazing. Cattle, bison, and horses have been present on the Bottoms since the establishment of the Fort Hall Indian Reservation in the mid 1800's. Today many streams support reduced salmonid populations and those streams that do have viable salmonid populations are in serious danger of extirpating remaining native salmonid stocks, through hybridization, competition, and further loss of habitat.

Streambank failures on Bottoms streams are a serious problem affecting aquatic biota through changes in habitat quality. Negative impacts from streambank failures include shallow widened channels, a reduction in riparian vegetation and instream cover, increased summer water temperatures, and deposition of fine sediments.

The primary goal of this project is to restore, enhance, and protect these streams so they again may support native salmonid populations at historical levels. Work to be done through the end of the project involves physical and biotic assessments of enhancement areas; developing and implementing fencing projects; placing habitat structures to aggrade sediment; improving water quality and bank stability; providing cover for fish; and an extended phase of monitoring, evaluation, and maintenance.

In other studies instream structures have increased pools (Binns 1994), usable spawning gravel, undercut banks (House and Boehne 1986) and habitat quality (Crispin et al. 1993). Numerous examples with beneficial results have been shown using structures in Danish watercourses to restore meanders, banks, riffles and spawning gravels, deep pools, water quality, and fish passage (Madsen 1995). Stream bank revegetation combined with fencing to exclude livestock has had widespread success in improving riparian vegetation, bank stability, water quality, and stream morphology (Madsen 1995; Clary and Webster 1989; Duff 1977); and although more difficult to prove, well designed studies have shown an associated increase in trout biomass (Binns 1994; House 1996;

Madsen 1995; Platts 1981; Platts and Rinne 1985; Rinne 1981).

The positive effects of deferred rotation grazing were documented by Myers and Swanson (1995). They found that deferred rotation areas showed much improvement in aquatic and riparian habitat but improvement was limited by the presence of roads. Rest-rotation grazing has been pursued on Reservation streams throughout this project with mixed results. Without constant enforcement, deferred rotation grazing plans have limited benefit. Grazing plans will be pursued in future with emphasis on limited road use and increased monitoring of grazing leases.

Activities in 2000 and beyond will follow those of previous years, except where experience has enabled streamlining of work and reduction of costs to achieve optimum results. An overall "gentle," or labor intensive yet low-tech, approach to stream restoration has proven far more effective than more expensive, high-tech, heavy equipment alternatives from both biological and political aspects. Working to optimize management of land and water use relating especially to irrigation and ranching has been highly successful and will continue to be promoted in this project. Riparian fencing is a priority of this project. A passive approach to stream restoration has shown to be effective in this project and others (Kauffman et al. 1997). Areas of stream that have been fenced during the past seven years have shown marked improvements in bank stability and density and diversity of riparian species. Improved grazing management plans will also be pursued vigorously during the course of this project. Instream habitat work will focus on placement of evergreen revetments and planting of willows. Lateral cover (i.e. evergreen revetments) have been shown to provide cover for juvenile fish in this study and others (Moore and Gregory 1988).

#### **b. Rationale and significance to Regional Programs**

This project addresses the principles of the 1994 Fish and Wildlife Program as outlined in Section 10.1A. Section 10.1A calls for protection, mitigation, and enhancement of resident fish populations affected by construction and operation of dams. Protection is provided for through fencing projects and innovative grazing management plans. Fish populations and riparian areas are enhanced through riparian plantings and placement of instream structures for fish cover. Operation of American Falls Reservoir and upstream projects directly adversely affects populations of native Yellowstone cutthroat trout and other fish species on the Fort Hall Reservation by degrading physical habitat (flooding and drafting during operations) and providing a source pool of non-native hatchery rainbow trout. The goal of this project is to provide conditions to recover weak populations of native Yellowstone cutthroat trout to self-sustaining levels on the Fort Hall Reservation by improving/providing suitable habitat. In addition, this project benefits other fish and wildlife resources through restoration and protection of sensitive riparian areas on the Fort Hall Reservation (Section 10.1B). This project is directly referenced in the Fish and Wildlife Program as measure 10.3E.10: "Implement habitat restoration and enhancement activities in Spring Creek and Clear Creek along the Fort Hall Bottoms located on the Fort Hall Reservation." It is also referenced under 10.3E.11: which provides funding for this project. Losses of fish and wildlife resources resulting from construction and operation of the Columbia Hydropower system directly negatively

affects the Shoshone-Bannock Tribes and abrogates many of the rights accorded by the the Fort Bridger Treaty of 1868. This project will increase fish and wildlife resources and provide for subsistence and cultural harvests mandated by the Treaty of 1868.

**c. Relationships to other projects**

This project is linked to the Shoshone Bannock/Shoshone Paiute joint culture facility which will provide seed stock to re-establish native Yellowstone cutthroat trout in Fort Hall Reservation streams (#9500600). Currently, less than five percent of streams on the Fort Hall reservation support pure populations of Yellowstone cutthroat trout. Hybridization and competition with non-native fishes has all but extirpated native cutthroat on and off the Fort Hall Reservation. The eventual goal of habitat restoration, enhancement, and protection is to provide conditions for self perpetuating populations of native Yellowstone cutthroat trout. Past monitoring has shown the project has significantly improved habitat for re-introduction efforts.

Both the Blackfoot and Portneuf Rivers run through state, private, and federal land in addition to reaches within the Fort Hall Reservation. Much of the work done on these rivers involves collaborative efforts with state and federal agencies, including; Idaho Dept. of Fish and Game and the Bureau of Land Management. The Resident Fisheries Program actively participates in Basin Advisory Groups and Watershed Advisory Groups to develop solutions to water quality problems in the Blackfoot, Upper Snake, Bear, and Portneuf watersheds.

Much of the labor intensive work done on the project is completed with the help of Salmon Corps, an offshoot of Americorps. The Salmon Corps (averaging 15-20 members) have proved invaluable in implementing low cost, low tech restoration activities related to this project.

**d. Project history (for ongoing projects)**

**Project Reports and Technical Papers**

Taki, D. and D. Arthaud. 1993. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1992 Annual Report to the Bonneville Power Administration, Project 92-10, Portland Oregon.

Arthaud, D. L. and D. Taki. 1994. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1993 Annual Report to Bonneville Power Administration, Project 92-10, Portland, Oregon.

Arthaud, D.L., Colter, C.G., and J. Gregory. 1995. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1995 Annual Report to Bonneville Power Administration, Project 92-10, Portland, Oregon.

Arthaud, D.L., C.G. Colter, and D.C. Moser. 1996. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1996 Annual Report to Bonneville Power Administration, Project 92-10, Portland, OR.

Moser, D.C. And C.G. Colter. 1997. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1997 Annual Report to Bonneville Power Administration, Project 92-10, Portland, OR.

Moser, D.C 1998. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1998 Annual Report to Bonneville Power Administration, Project 92-10, Portland, OR.

## **Results**

Results from the first seven years of this project show that habitat enhancements in 1.9 km of Clear Creek increased wild trout populations 5-12 times and biomass 3-4 times over pre-treatment conditions (Moser 1998). Clear Creek is a low gradient, sinuous, spring creek characterized by a silt substrate greater than one meter in depth along much of its length. Pre-project and post-project core sampling has shown placement of rock wing dams and rootwads in Clear Creek has created localized areas of substrate with fewer fines. McNeil-Ahell core samples taken in 1992 (pre) were compared to samples taken in 1997 (post); percent fines were significantly higher in 1992 (11%) than in 1997 (6.69%) ( $P = 0.0003$ ), indicating structures had created areas of clean gravel (Moser and Colter 1997). These areas of clean gravel provide much needed sites for invertebrate colonization and salmonid spawning, severely lacking in most areas of the stream.

Average maximum water depths in Clear Creek were significantly higher in treated areas after enhancement activities ( $P < 0.05$ ). There were no significant differences in average maximum depth in controls (Moser and Colter 1997). Within two years, a bison exclosure fence along 2.5 km of Clear Creek reduced bare streambanks from a 30% frequency to less than 5%. In addition, riparian areas within exclosures showed a regrowth of willows, dogwoods, birch, and assorted wetland plant species. Bank stabilization, revegetation, and protection work on Spring Creek has reduced eroding unvegetated banks from 15% frequency down to 9% (1,000 m of stabilized bank) (Arthaud et al. 1996). Peak fry densities in areas where evergreen revetments were installed on Spring Creek averaged  $0.71 \text{ fry/m}^2$  over a seven year period, whereas in areas of bare bank fry densities ranged from  $0-0.04 \text{ fry/m}^2$  (Moser 1998).

Techniques for monitoring and implementation have changed many times over the past seven years. Through this iterative process, project costs have been kept low during the past seven years with the use of low-tech/low cost restoration techniques. Much of the implementation has been carried out by Salmon Corps with the use of simple hand tools. Major expenses have included purchase of jack and rail exclosure fencing.

Fencing, along with grazing management plans have proved to be valuable tools in allowing riparian areas and stream systems to heal naturally.

**e. Proposal objectives**

Objectives

Objective 1: Collect baseline data at project locations.

Objective 2: Install habitat improvement structures to increase existing juvenile and adult salmonid habitat (i.e. spawning, rearing, and object cover).

Objective 3: Protect and restore riparian habitats of Reservation streams.

Objective 4: Deter and reduce non-game fish migrations into the Fort Hall Bottoms

Objective 5: Promote fisheries management objectives in the Snake River Basin.

Objective 6: Prepare annual and quarterly reports on project progress and results.

**f. Methods**

Objectives and Tasks

Objective 1: Collect baseline data at project locations.

Task a: Measure stream habitat variables in project locations for pre and post treatment evaluation.

Techniques used will be similar to the USDA Forest Service General Aquatic Wildlife System Level III (USDA 1989) depending on

stream size and type of habitat modifications implemented.

Variables to be evaluated will include, but not be limited to: stream channel profile, discharge, substrate composition, percent cover by cover type, bank composition/stability, pool:riffle ratio, *pH*, DO, specific conductance, Total Dissolved Solids, riparian vegetation composition, and canopy density. Substrate composition will be measured with a McNeil-Ahnell core sampler using techniques described by Hamilton and Bergerson (1989). Water temperature will be monitored with Stowaway temperature recorders.

Task b: Obtain fish and invertebrate compositions, population estimates, and trends for all streams that will be affected by habitat restoration efforts.

A backpack electrofisher will be used to sample fish in small streams, a tote barge to sample moderately sized streams, and an electrofishing boat to sample the Portneuf and Blackfoot rivers, Bannock, Spring and lower Clear creeks. Estimates will be made using the Peterson mark-recapture method ( $N=MC/R$ ) from boat samples, and the Zippin multiple pass removal method (Zippin 1956)—or modified single pass method to reduce injury—with the backpack and tote barge electrofishers. Snorkeling will be used to estimate population densities in some streams, specifically densities of fry at treatments and at controls (Malvestuto 1983). Invertebrates will be sampled throughout each year using Serber and Hess samplers and Ponar substrate dredges.

Objective 2: Install habitat improvement structures to increase existing juvenile and adult salmonid habitat (i.e. spawning, rearing, and object cover).

Task a: Evaluate habitat enhancement projects implemented in previous

years to determine which methods most effectively increased salmonid biomass and usable habitat. Analysis of variance (ANOVA) will be used to compare pre and post treatment stream width, mesohabitat area, maximum water depth, mean water depth, and mean wetted silt depth. ANOVA will also be used to compare changes in substrate pertaining to usable spawning gravel every two years after structure placement. Surveys similar to GAWS level III will be used to estimate habitat parameters. Fish populations will be sampled during spring or fall to determine which type of habitat had the greatest success increasing numbers and biomass of wild trout.

- Task b: Construct and install selected habitat structures in project areas. These will include; rock and log wing dams and barbs and evergreen revetments. We will add treatment strata to Clear Creek mostly downstream from current locations. Unstable banks on Spring Creek will be treated over the length of the stream, and to a lesser extent channel improvements for spawning bars, adult and juvenile cover. Big Jimmy, Jeff Cabin, Diggie, Kinney, Jimmy Drinks, Ross Fork, and Bannock creeks may also be treated similarly. No river mile locations are available, but project areas are parallel to Snake River miles 726 through 750.
- Task c: Monitor fish populations annually or biennially, revegetation mortality seasonally, and stream cross-section profiles annually or biennially.
- Task d: Maintain bank and channel treatments on an as needed basis.

Objective 3: Protect and restore riparian habitats of Reservation streams.

- Task a: Slope banks if necessary. Plant pole cuttings of native willow and

cottonwood and seedlings of native riparian grasses and wetland plants in heavily eroded and unstable bank areas (Hoeg and Ogle 1995). Monitor plant survival seasonally. If soil in upper banks becomes dry, water on an as needed basis.

Task b: Erect fences to protect riparian areas and critical spawning habitats, yet provide livestock adequate access to water at crossings. Erect fence to protect bank revegetation where banks have been sloped. Protection exclosures will be erected primarily on Clear, Diggie, Spring, Bannock, and Ross Fork creeks. Erect fences to protect riparian areas and critical spawning habitats. Implement grazing management programs to protect riparian areas (i.e. rest-rotation).

Task c: Maintain fences on an as needed basis. Exclosures will remain in place as long as necessary, until changing grazing leases or restored riparian vegetation warrant removal.

Objective 4: Deter and reduce non-game fish migrations into the Fort Hall Bottoms streams.

Task a: Maintain permanent weir in Spring Creek to prevent invasion of non-native fishes from American Falls Reservoir.

Task b: Remove common carp *Cyprinus carpio* from Clear, Big Jimmy, and Spring Creeks when sampling for trout.

Objective 5: Promote fisheries management objectives in the Snake River Basin.

Task a: Participate in forums and meetings that affect regional use, storage, and regulation of Snake River flows to promote fisheries restoration on the Fort Hall Reservation.

Task b: Solicit, design, and cost-share projects pertaining to Snake and Blackfoot rivers and American Falls Reservoir habitat enhancement and management.

Objective 6: Prepare reports on project progress and results.

Task a: Analyze data and draft the annual report containing information listed in the terms and conditions of contract 92-10.

Task b: Submit quarterly reports addressing progress by task on objectives 1-5.

**g. Facilities and equipment**

All office space and field equipment is currently provided for at the Shoshone-Bannock Tribes Fisheries Department. The fisheries department has three backpack electrofishers, a tote barge electrofisher, and a Smith-Root boat electrofisher for estimation of fish population densities and biomass. Other field equipment includes nets, waders, field notebooks, meter tapes, invertebrate sampling equipment, etc. All equipment necessary for implementation and monitoring have been purchased in prior years of this project. Replacement and repair of existing items will be necessary in future years.

**h. Budget**

The budget for personnel includes monies for a Resident Fisheries Coordinator, Field Biologist (part), Technician, Field Assistant, and a Secretary (part) (\$54,000). This is the minimum amount of personnel to effectively implement the project. Additional help with field work is provided by the Salmon Corps (listed under subcontractors @ \$5,000). Fringe and indirect costs associated with personnel are based on costs from past budgets approved by the Shoshone-Bannock Tribes (\$38,621). Supplies, materials, and non-expendable property, including; field supplies, office supplies, and gas & oil are the minimum necessary to maintain the project for one fiscal year (\$3,200). Money was budgeted for approximately 1.5 km of jack and rail fencing (\$20,000). Jack and rail fencing has excellent longevity and has proved to be effective in protecting sensitive riparian areas from cattle, horses, and bison. Operations and maintenance funds (\$3,000) are needed for repair of electrofishing equipment, generators etc. Field equipment is necessarily subject to breakdown and monies for repairs are needed to assure collection of data during the busy field season. Money is budgeted for travel to professional

meetings and workshops (\$4,000). Attendance at peer sponsored meetings is critical for exchange and dissemination of ideas about status of resources in the basin and efficacy of restoration techniques. A pickup lease (\$5,000) is necessary for travel to and from restoration sites and local meetings.

## **Section 9. Key personnel**

### ***Résumé***

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### **Education**

Bachelor of Science, Humboldt State University, 1989.  
Major: Freshwater Fisheries  
Major Advisor: Terry Roelofs, Ph.D.

Master of Science, Idaho State University, 1993.  
Major: Aquatic Ecology  
Major Advisor: G. Wayne Minshall, Ph.D.

### **Experience**

Most recent experience:

Resident Fisheries Biologist/Program Manager. Position in Resident Fisheries Program (RFP) responsible for soliciting, implementing, and maintaining Bonneville Power Administration and other contracts; planning biologically sound long-range fisheries restoration programs on and off the Fort Hall Reservation; assist in managing fishery resources, personnel, budgets, and equipment, under the RFP Coordinator. Technical consultant during the Bear River FERC re-licensing process. Compiled, analyzed, and wrote annual resident fish reports for the Bonneville Power Administration and the Bureau of Indian Affairs in 1996 and 1997.

Fisheries Field Biologist for the Shoshone-Bannock Tribes. Responsible for implementation and maintenance of the resident fisheries program on the Fort Hall Indian Reservation. Duties included; supervision of field crews ranging from 5-20 technicians and Salmon Corps personnel. Collection and analysis of fish population data using electrofishing equipment (boat and backpack) and snorkeling. Measurement of sediment levels and changes in channel characteristics of project streams. Measurement of water quality parameters, including; DO, Total Dissolved Solids, Conductivity, and pH.

Collection and analysis of invertebrate data. Stabilization of eroding banks using sloping, revetment and re-vegetation techniques. Participated in Blackfoot and Portneuf Watershed Council meetings.

### **Publications and Presentations**

Moser, D.C. and G.W. Minshall. 1996. Effects of Localized Disturbance on Macroinvertebrate Community Structure in relation to Mode of Colonization and Season. *Am. Midl. Nat.* 135:92-101.

Moser, D.C. And C.G. Colter. 1997. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1997 Annual Report to Bonneville Power Administration, Project 92-10, Portland, OR.

Moser, D.C. 1998. Fort Hall Reservation Stream Enhancement: Shoshone-Bannock Tribes 1998 Annual Report to Bonneville Power Administration, Project 92-10, Portland, OR.

## **Section 10. Information/technology transfer**

Information/technology transfer will be provided through annual reports, presentations at professional society meetings, and presentations at local Watershed Advisory Groups and Basin Advisory Group meetings.

## **Congratulations!**